American Water Works Association

The Authoritative Resource for Safe Drinking Water SM

AMERICAN WATER WORKS ASSOCIATION
BEFORE THE
WATER RESOURCES AND THE ENVIRONMENT SUBCOMMITTEE
COMMITTEE ON TRANSPORTATION AND INFRASTRUCTURE
U. S. HOUSE OF REPRESENTATIVES

STATEMENT ON

AGING WATER SUPPLY INFRASTRUCTURE

APRIL 28, 2004

PRESENTED BY
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OFFICE OF WATERSHEDS
PHILADELPHIA WATER DEPARTMENT
PHILADELPHIA, PENNSYLVANIA

INTRODUCTION

Good morning Mr. Chairman. I am Howard Neukrug, Director of the Office of Watersheds for the Philadelphia Water Department in Pennsylvania. The Philadelphia Water Department is a municipal water, wastewater and storm water utility serving over two million people in the Philadelphia metropolitan area. I serve as the Chair of the American Water Works Association (AWWA) Water Utility Council (WUC). I am here today on behalf of AWWA. AWWA appreciates the opportunity to present its views on drinking water infrastructure needs.

Founded in 1881, AWWA is the world's largest and oldest scientific and educational association representing drinking water supply professionals. The association's 57,000 members are comprised of administrators, utility operators, professional engineers, contractors, manufacturers, scientists, professors and health professionals. The association's membership includes over 4,800 utilities that provide over 80 percent of the nation's drinking water. AWWA and its members are dedicated to providing safe, reliable drinking water to the American people.

AWWA utility members are regulated under the Safe Drinking Water Act (SDWA) and other statutes. AWWA believes few environmental activities are more important to the health of this country than assuring the protection of water supply sources, and the treatment, distribution and consumption of a safe, healthful and adequate supply of drinking water.

AWWA and its members commend you for holding this hearing to address the growing infrastructure needs facing public drinking water systems and their customers in the coming years. In previous testimony in Congress and in our report entitled Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure, published in May 2001, AWWA called for a new partnership for investing in drinking water infrastructure. AWWA recommended changing and expanding the existing Drinking Water State Revolving Fund to significantly increase federal funding for projects to repair, replace, or rehabilitate drinking water infrastructure to include the aging distribution pipes. We would be pleased to provide a copy of this report for the subcommittee's record.

The events of September 11, 2001, have added a new dimension to the protection of drinking water and infrastructure needs. Public water systems now face significant costs to increase the security of the nation's community water systems. AWWA estimates that drinking water utilities need to spend approximately $1.6 billion immediately to protect water system's critical assets with improved perimeter security and access controls. This does not include the capital costs of upgrades to address vulnerabilities identified in vulnerability assessments such as hardening pumping stations, chemical storage buildings, transmission mains, adding redundant infrastructure or relocating facilities and pipelines.

A safe and secure drinking water infrastructure is one resource that all Americans rely on every day. It is a cornerstone of both our economic well being and our public health. Largely buried underground and invisible, it is also a resource many have taken for granted.

In our statement today, we will summarize the drinking water infrastructure need, the security needs of public water systems and the replacement of lead service lines.

FEDERAL MANDATES AND THE CONTEXT FOR DRINKING WATER AND WASTEWATER INFRSTRUCTURE FUNDING ISSUES

Both drinking water and wastewater utilities face enormously expensive federal mandates that set the context for all other funding issues. The drinking water community faces a complex array of expensive new federal requirements and new standards, including standards for arsenic, radon, disinfection byproducts, enhanced surface water treatment, and others. Wastewater utilities also face enormously expensive federal mandates, such as those relating to Combined Sewer Overflows (CSO) and Sanitary Sewer Overflows (SSO). For both water and wastewater utilities, these needs significantly skew financing for other investments, including the replacement of aging pipes, appurtenances, and other infrastructure. Local ratepayers are often seriously challenged to pay for these mandates, and little, if any, room is left in the ratepayer's budget for other vital spending. In many cases, it appears that mandatory spending for clean water mandates has "driven out" the ability to raise rates for drinking water needs.

We believe that significant federal assistance, including grants, is necessary and justified to help meet the cost of these very expensive federal mandates on water and wastewater utilities, and to meet the costs of infrastructure repair and replacement that have been, in many cases, deferred because federal mandates have consumed the ratepayer's budget.

We would point out that, in the case of CSO and SSO mandates, federal support for the cost of those requirements is not only justified in the community receiving federal support, it also lowers costs for drinking water utilities downstream in the form of improved water quality. This is especially true in critical source water protection areas.

DRINKING WATER INFRASTRUCTURE NEEDS

Estimates of Need

In September 2002, the U.S. Environmental Protection Agency (EPA) released a Clean Water and Drinking Water Infrastructure Gap Analysis which found that there will be a $535 billion gap between current spending and projected needs for water and wastewater infrastructure over the next 20 years. In May 2002, the Congressional Budget Office estimated the spending gap for drinking water needs between $70 billion and $362 billion over 20 years. In AWWA's report entitled Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure, AWWA estimates the drinking water infrastructure needs to be $250-300 billion over the next 30 years. By any estimate, the gap is real and is big. All estimates suggest an emerging large cost for drinking water infrastructure. As illustrated in the AWWA report the "demographics" of pipe replacement is big and the bill is coming due soon. This challenge is exacerbated by population shifts and growth patterns over the years, economic conditions and the changed demographics of urban populations. .

Why is the need emerging now?

Water is by far the most capital intensive of all utility services, mostly due to the cost of pipes - water infrastructure that is buried out of sight. Most of drinking water pipes were originally installed and paid-for by previous generations. They were laid down during the economic booms that characterized the last century's periods of growth and expansion. Pipes last a long time (some more than a century) before they cost very much in maintenance expense near the end of their useful life, or ultimately need replacement. For the most part, then, the huge capital expense of pipes is a cost that today's customers have never had to bear. However, replacement of pipes installed from the late 1800s to the 1950s is now hard upon us at the beginning of the 21st Century and replacement of pipes installed in the latter half of the 20th Century will dominate the remainder of the 21st Century. This is a significant change that ushers in a completely new era in water utility financing.

Recognizing that we are at the doorstep of a new era in the economics of water supply, the replacement era, the American Water Works Association (AWWA) did an analysis of 20 utilities throughout the nation to understand the nature and scope of the emerging infrastructure challenge. The project involved correlating the estimated life of pipes with actual operations experience in the sample of 20 utilities. Projecting future investment needs for pipe replacement in those utilities yielded a forecast of the annual replacement needs for a particular utility, based on the age of the pipes and how long they are expected to last in that utility. By modeling the demographic pattern of installation and knowing the life expectancy of the pipes, AWWA estimated the timing and magnitude of that obligation. The analysis was published in May 2001 in the report entitled Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure. This analysis graphically portrays the nature of the challenge ahead of us. We will summarize the highlights of the analysis in this statement.

Pipe Replacement Value

The original pattern of water main installation from 1870 to 2000 in 20 utilities throughout the nation analyzed by AWWA is a reflection of the overall pattern of population growth in large cities across the country. There was an 1890s boom, a World War I boom, a roaring '20s boom, and the massive post-World War II baby boom**.**

The oldest cast iron pipes - dating to the late1800s - have an average useful life of about 120 years. This means that as a group these pipes will last anywhere from 90 to 150 years before they need to be replaced, but on average they need to be replaced after they have been in the ground about 120 years. Because manufacturing techniques and materials changed, the roaring '20s vintage of cast iron pipes has an average life of about 100 years. And because techniques and materials continued to evolve, pipes laid down in the post World War II boom have an average life of 75 years, more or less. Using these average life estimates and counting the years since the original installations, it's clear that water utilities will face significant needs for pipe replacement in the next couple of decades.

The cumulative replacement cost value (the cost of replacement in constant year 2000 dollars) of water main assets has increased steadily over the last century in our sample of 20 utilities. In aggregate across our sample of utilities, the replacement value of water mains in today's dollars is about $2,400 per person. This is more than three times what it was in 1930 in constant year 2000 dollar terms. The difference is not due to inflation; rather, there is simply more than three times as much of this infrastructure today as there was in 1930, in order to support improved service standards and the changing nature of urban development. In older cities the per capita replacement cost value of mains today is as high as nine times the 1930 level (in constant year 2000 dollars) due to loss of center city population.

Reflecting the pattern of population growth in large cities over the last 120 years, the AWWA analysis forecasts investment needs that will rise steadily like a ramp, extending throughout the 21st Century. By 2030, the average utility in our sample of 20 will have to spend about three and half times as much on pipe replacement as it spends today.

Many water systems all across America have seen this day coming and have already begun to ramp-up their expenditures on pipe rehabilitation and replacement. But it is clear that for most utilities this problem is just emerging and is enormous in scope.

Pipe Repair Costs

As pipe assets age, they tend to break more frequently. But it is not cost-effective to replace most pipes before, or even after, the first break. Like the old family car, it is cost efficient for utilities to endure some number of breaks before funding complete replacement of their pipes.

Considering the huge wave of aging pipe infrastructure created in the last century, we can expect to see significant increases in break rates and therefore repair costs over the coming decades. This will occur even when utilities are making efficient levels of investment in replacement that may be several times today's levels. In the utilities studied by AWWA, there will be a three-fold increase in repair costs by the year 2030 despite a concurrent increase of three and one- half times in annual investments to replace pipes.

Water Treatment Plant Costs.

Replacement of water treatment assets presents a different picture from that of the pipes, but greatly complicates infrastructure funding for utilities. Major investments in water and wastewater treatment plants were made in several waves following the growing understanding of public health and sanitary engineering that evolved during the 20th Century. Of course, the installation pattern of treatment assets also reflects major population growth trends. But whereas pipes can be expanded incrementally to serve growth, treatment must be built in larger blocks. Investments in treatment thus present a more concentrated financing demand than investments in pipes.

Treatment assets are also much more short-lived than pipes. Concrete structures within a treatment plant may be the longest lasting elements in the plant, and may be good for 50 to 70 years. However, most of the treatment components themselves typically need to be replaced after 25 to 40 years or less. Replacement of treatment assets is therefore within the historical experience of today's utility managers. Even so, many treatment plants built or overhauled to meet EPA standards over the last 25 years are too young to have been through a replacement cycle. Many are about due for their first replacement in the next decade or so.

The concurrent need to finance replacement of pipes and of treatment plants greatly increases the challenge facing utilities. While spending for the replacement of pipes rises like a ramp over the first part of the 21st Century, spending for treatment plant replacement will occur at intervals causing "humps" in capital needs on top of the infrastructure replacement capital needs. This is graphically illustrated in the attached "Projected Total Replacement Expenditures Due to Wear-Out" graph of the BHC Company water utility (now named Aquarion Water company of Connecticut) in Bridgeport, Connecticut, from the AWWA report. This pattern has been found to be common in many water utilities and has been nicknamed "The Nessie Curve" because of its resemblance to depictions of the Loch Ness Monster.

Demographic Changes.

Water utilities are the last natural monopolies. The large investment required in pipe networks makes it impossible to have more than a single provider of water service within a given area. These large investments are also a major source of financial vulnerability for water utilities due to the very fixed nature of the assets and the very mobile nature of the customers. When populations grow, the infrastructure is expanded, but when people move away, the pipe assets and the liability for repair and replacement remain behind, creating a financial burden on the remaining customers. This problem, known as "stranded capacity" (essentially, capital facilities that are not matched by rate revenue from current customers), is typical of the demographics of older cities and adds considerably to the challenge of funding replacement in these cities.

In Philadelphia, over the one hundred years from 1850 to 1950, the population grew from 100,000 to 2 million people. But from 1950 to the end of the century, Philadelphia lost 25 percent of its population, dropping to 1,500,000. This situation was replicated again and again throughout the older cities of the Northeast and Midwest. The effect is to increase the burden of replacement funding on the remaining residents of the city.

As previously mentioned, the average per capita value of water main assets in place today across our sample of 20 utilities is estimated to be three times the amount that was present in 1930. In Philadelphia, however, that ratio is almost eight times the average per capita value of water main assets in 1930 due to population declines since about 1950.

Demographic change, then, places financial strain on all public water systems and has a direct impact on affordability of the investment required.

Affordability of Rates

A central question for policy makers and utilities, then, is whether the increased rate of infrastructure spending that utilities now face over the next 30 years can be financed by the utilities themselves at rates customers can afford.

Some estimates indicate that total spending on water and wastewater infrastructure will have to double or triple in most communities to meet these needs, if consumers are forced to bear the entire infrastructure cost. The cost of compliance with storm water regulations alone may dwarf domestic drinking water and wastewater expenditures. Therefore, the impact on household affordability and rates of projected drinking water infrastructure expenditures must be viewed in the context of the total water and wastewater utility infrastructure bill to be paid by the consumer.

In the sample of 20 utilities studied by AWWA, the analysis showed an aggregate increase in needed utility expenditures above current spending levels of $3 billion by 2020 and $6 billion by 2030. This implies the need for collection of an additional $1,575 per household for infrastructure repair and replacement over 30 years. The estimated $1,575 per household is an average of the individual results. The individual utilities in the survey present wide-ranging needs for increased expenditure (from $550 per household over 30 years to $2,290 per household over 30 years) and "lumpy" patterns of increased expenditure needs that are unique to each set of circumstances.

The sample of 20 utilities represents relatively large utilities that are on the "cutting-edge" of utility management. The household expenditure increase will be much higher in small systems that do not have a large rate-base over which to spread the costs. Extrapolating from EPA's estimated 20-year capital need for small systems, the AWWA analysis projects the total 30-year expenditure for infrastructure repair and replacement in small systems might be in a range of $1,490 per household to $6,200 per household.

Moreover, there is no guarantee that the projected expenditures per household can be spread evenly or taken on gradually over the 30-year period. There are "humps" for treatment plant replacement throughout the period. Additionally, expenditure "humps" for compliance with a dozen or more new regulations is not included in this analysis.

LEAKING PIPES

The way we manage our water resources to serve human needs has a major impact on the quality of the natural environment and the costs that ratepayers must bear. Water conservation is a major public policy concern because of the significant environmental benefits and energy and cost savings to be gained. Saving water is saving dollars. The facilities that we have built to dam, divert, transport, pump and treat water are among the largest infrastructure engineering projects on earth and are a great part of the cost of drinking water. Aging distribution systems can be a source of water loss that drives up the cost water. The cost of the lost water is reflected in the need build more or larger treatments plants to produce more water, to pump more water at increased energy costs and to build more storage capacity for drinking water needs. Studies have shown that conserving water through such things as replacing aging infrastructure with leaking pipes can help delay the need for developing expensive new drinking water supply and treatment facilities. An AWWA Research Foundation report in 1994 conservatively estimated the cost of lost water alone to be $2.8 billion per year nationally ($3.5 billion in 2003 dollars). A 1995 Western Canada Water and Wastewater Association report on leak detection estimated that a water savings of 4 percent to 20 percent can be achieved through the elimination leaks from the distribution system. When the cost of lost water, energy costs and the cost avoidance of new infrastructure are added together, the money invested in replacing aging leaking infrastructure is a good return on investment for the nation.

DRINKING WATER SECURITY NEEDS

The al Qaeda terrorist network and others are known to have conducted research on drinking water systems in the United States and abroad. If the intent is to create terror in our society, water systems serving large, medium, and small communities could all be targets of opportunity for terrorists, not only to contaminate the water supply, but also to deny first responders water for fire protection in a coordinated terrorist attack.

Drinking water utilities have a long history of emergency and security preparedness. They have fencing in place around facilities, they hire security staff, they safeguard computer systems, many use real-time water monitoring, etc. However, the post-September 11 world added a new dimension to our understanding of security and the steps needed to protect our citizens. Congress has made funds available for the largest utilities to conduct “vulnerability assessments” and to take a harder look at emergency response plans. These assessments can identify areas where utilities need to add new security features and other safeguards against malevolent possible attack. Security needs will manifest themselves in different ways in different utilities. Some utilities may require additional and better fencing. Some may need to upgrade entrance access points for personnel and supply vehicles. Others may have to harden existing pump buildings, chemical storage buildings, and transmission mains, or add redundant infrastructure. And some may actually have to relocate facilities, including pipelines and distribution mains

The response to these concerns will be highly local, and it will be expensive. But without question, it will enhance the security of the American drinking water supply.

Cognizant of the many needs facing drinking water utilities, AWWA did an analysis to estimate the costs to undertake the immediate next steps in water system security: The cost of upgrading systems to ensure secure control of access to critical utility assets in community water systems subject to the Bioterrorism Act is approximately $1.6 billion. This does not include the capital costs of upgrades to address vulnerabilities identified in vulnerability assessments such as hardening pumping stations, chemical storage buildings, transmission mains, adding redundant infrastructure or relocating facilities and pipelines. Thousands of community water systems must make such investments to close vulnerabilities identified in the assessments done under the Bioterrorism Act. Nationwide, these needs undoubtedly total billions of dollars, and can be considered the cost of a secure water supply. Because homeland security is primarily a federal responsibility and the security needs are so large that they would swamp utility finances and funds through existing programs, Congress should consider providing water security improvement grants.

LEAD SERVICE LINES

Recently, there has been much interest in Congress about the elevated levels found in drinking water in Washington, DC. Much of the discussion has centered on the lead service lines between the distribution system and the home plumbing. We cannot speak to the specifics of the situation in Washington, DC. The matter is still under investigation and AWWA has no direct knowledge of the cause of the elevated lead levels found in tests of drinking water in Washington, DC, or any remedial action that has been taken or should be taken. Nor does AWWA have any information that would suggest that the problem experienced in Washington, DC, is occurring in other public water systems across the country. We can, however, provide general information concerning the source of lead in drinking water.

Lead is a naturally occurring metal that was used regularly in a number of industrial capacities for most of the 20th century. Lead was used a component of paint, piping (including water service lines), solder, brass and as a gasoline additive until the 1980’s. According to the U.S. Environmental Protection Agency (USEPA), lead paint today is the leading household source of lead exposure in older housing and the contaminated dust and soil it generates. Research has confirmed that lead is highly toxic. Ingestion of lead is a serious health risk to humans, especially children. Health risks linked to lead ingestion include: increased blood pressure, reduced I.Q. levels, brain damage, loss of hearing, stunting physical growth, reduced learning power, premature births, low birth-weight, fertility problems and miscarriages. Since 1974, the lead concentrations in humans have been reduced 74 percent primarily due to the removal of lead from gasoline and lead solder from cans

Although it rarely occurs naturally in water, USEPA estimates that 15 to 20 percent of human lead intake is received via drinking water. Lead contamination occurs ***after*** water has left the treatment plant when it travels through piping and plumbing containing lead. Water can be very corrosive, and in some cases will eat away at the pipes and plumbing through which it passes. This corrosion can occur in home fixtures as well, if they are made of materials, like brass, which contain lead. Brass fixtures and lead solder installed inhome plumbing prior to 1986 are sources of lead exposure in drinking water. Grounding of telephone and electrical circuits in homes to water lines and galvanic action between two dissimilar metals can cause increased lead levels in drinking water even when a public water system has optimized corrosion control.

In 1986, Congress passed amendments to the Safe Drinking Water Act, effectively banning the continued use of lead in materials used in drinking water systems. This legislation prohibited the use of pipe, solder or flux containing lead and required specific public notification about the presence of lead in its drinking water or drinking water system.

In 1991, USEPA promulgated the Lead and Copper rule (LCR), that established maximum acceptable levels of lead in a drinking water system and required water utilities to reduce and maintain its water corrosivity to prevent pipes with lead in them from deteriorating into the water supply. The LCR established a 15 parts per billion (ppb) action level at the 90^{th} percentile for taps monitored. When a public water system exceeds the 15ppb action level, it is required to develop and undertake a lead service line replacement (LSLR) program. The LCR requires that a system replace 7 percent of the lead service lines which the system owns each year until all of the lines have been replaced, or until tap water monitoring indicates that its 90^{th} percentile lead level is equal to or less than 15ppb action level. As part of its corrosion control strategy, a public water system may add a corrosion inhibitor such as zinc orthophosphate. While this means of corrosion control is effective and necessary to protect public health, the down side is the increased phosphate content in the wastewater stream. Phosphate is a limiting nutrient in most surface waters to which wastewater is discharged and is regulated under the Clean Water Act because of its potential to contribute eutrophication of natural waters.

The cost of replacing lead service lines is independent of estimates for replacing aging drinking water distribution systems. When the LCR was promulgated in 1991, USEPA estimated that it would cost $1.5 - 6.25 billion nationally ($2.1 - $8.65 billion in 2003 dollars) to remove lead service lines. The LCR estimate is for replacement that will occur as a result of the rule. The USEPA estimate is based on the assumption that 8,300 of the 15,000 systems with lead service lines will be required to replace some lead service lines at a per service line costs of $900 - $1,800. A later study conducted by the AWWA Research Foundation in 1994 estimated that there was a total of some 2.3 to 5.1 million lead service lines in the nation. Removal the utility owned portion of the lead service line would cost $3.4 to $5.1 billion nationally ($4.2 - $6.3 billion in 2003 dollars). To replace entire lead service lines, that is both the portion owned by the property owner and the utility, would cost approximately $10-$14.1 billion nationally ($12.3 - $17.5 in 2003 dollars).

Lead service line replacement is further exacerbated by the ownership of the lead service lines. In some instances the water utility owns the entire line. In others, the property owner owns the entire service line. And in still other cases, part of the lead service line is owned by the utility and part by the property owner. A public water system can only be held legally liable for replacing the service line or part of the service line owned by the utility. All agree that partial replacement of a lead service increases lead levels in water. A public water system has no legal means to compel a property owner to replace a lead service line or portion of a lead service line. Some property owners may be unable to afford the cost and local or state restrictions may prevent a public water system from paying for or financing the lead service line removal. A public water system has access to the Drinking Water State Revolving Fund (DWSRF) to fund lead service line removal. A property owner may not have such easy access to fund lead service line replacement. In 1991, AWWA recommended in testimony that Congress consider enacting a tax credit for property owners who must pay for the removal of lead service lines. We still believe this is a good idea that is in the interests of public health in this country.

CONCLUSION

How we address our emerging drinking water infrastructure and security needs is a critical question facing the Nation and this Congress. America needs a new partnership for reinvesting in drinking water infrastructure. There are important roles at all levels of government. To help reduce the burden on consumers, many water utilities have made great strides in efficiencies, with some utilities achieving a 20 percent savings in operations and maintenance. Water utilities will continue to reduce costs, seek cost-effective financing and employ innovative management strategies. Regardless, there will be significantly increased costs for needed infrastructure investment.

AWWA does not expect that federal funds will be available for 100 percent of the increase in infrastructure and security needs facing the nation's water utilities. AWWA remains committed to the principle of full cost recovery through rates. However, AWWA does believe that due to concurrent needs for investment in water and wastewater infrastructure, security projects, replacement of treatment plants, new drinking water standards, and demographic changes, many utilities will be very hard pressed to meet their capital needs without some form of federal assistance. Much of our investment need is driven by federal mandates and new security needs. The nation has already accepted the principle that the federal government should help pay for what it requires other levels of government to do. Over the next twenty years, it is clear that Safe Drinking Water Act (SDWA) and Clean Water Act (CWA) compliance requirements and infrastructure needs will compete for limited capital resources. New security concerns, combined with the aging of many water systems, plus the capital cost of compliance with federally mandated regulations, such as lead service line replacement, drive the need to greatly increase the level of investment in water-related infrastructure now. Customers are likely to be very hard pressed in many areas of the country. Compliance, security and infrastructure needs under the SDWA and CWA can no longer be approached as separate issues. Solutions need to be developed in the context of the total drinking water and wastewater compliance, security and infrastructure needs.

AWWA and its members thank you for holding this hearing concerning the infrastructure needs of the Nation's drinking water utilities. AWWA pledges to work with Congress to develop a responsible and fair solution to the Nation’s growing drinking water infrastructure security challenges. We thank you for your consideration of our views.

This concludes the AWWA statement on drinking water infrastructure needs. I would be pleased to answer any questions or provide additional material for the subcommittee.

BHC, Bridgeport, Connecticut

Asset Sets Modelled: Water Mains & Water Supply Plant –
Estimated Replacement Value $1,663 M